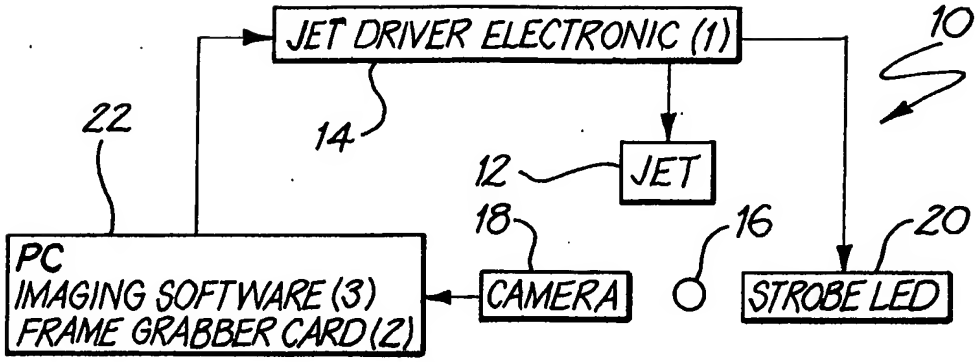

FIG. 1

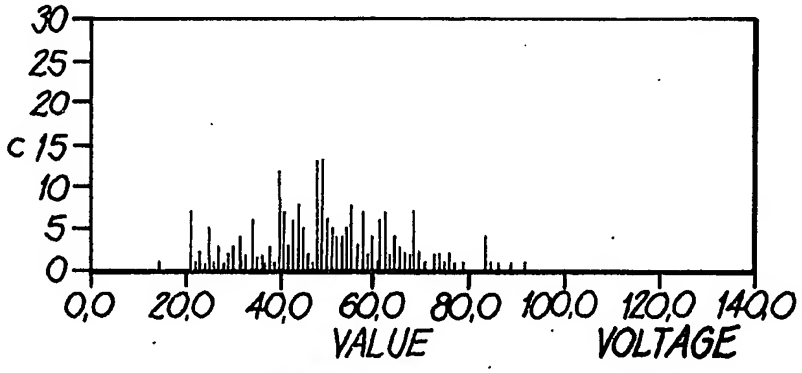

FIG. 2

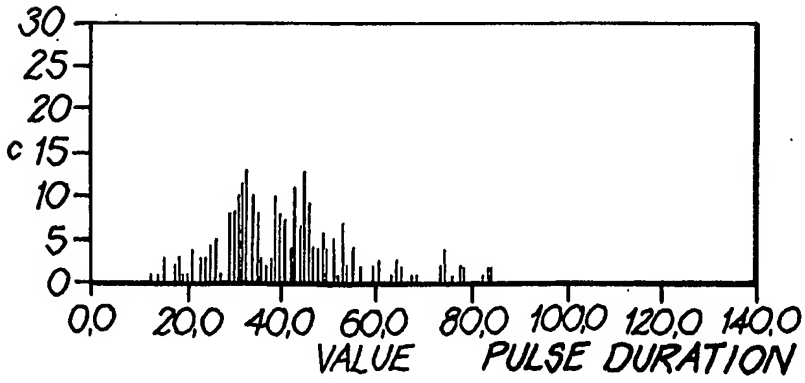

FIG. 3

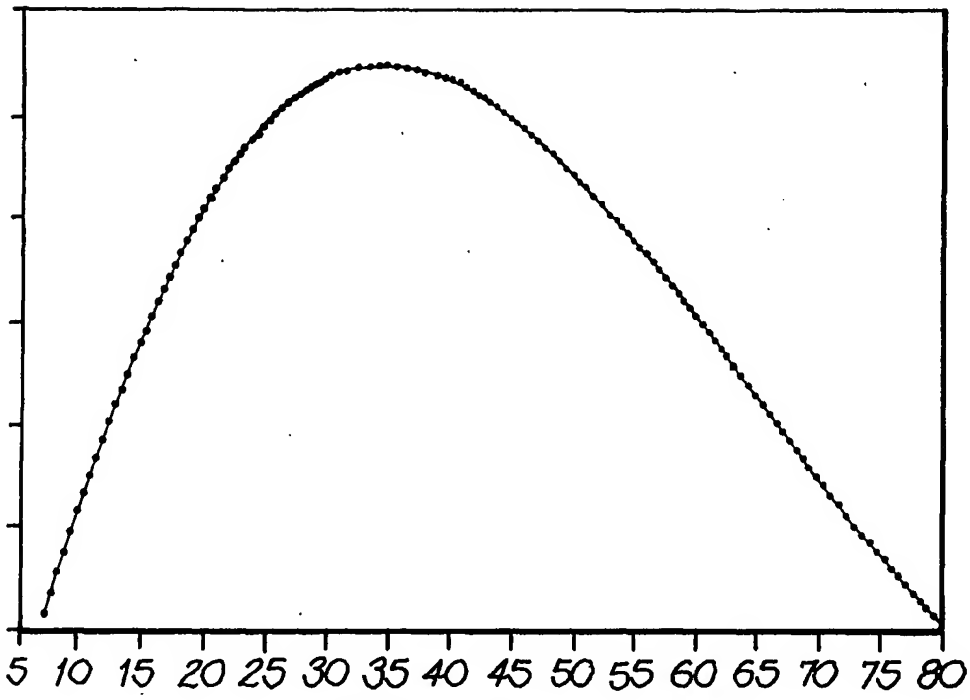
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

FIG. 4

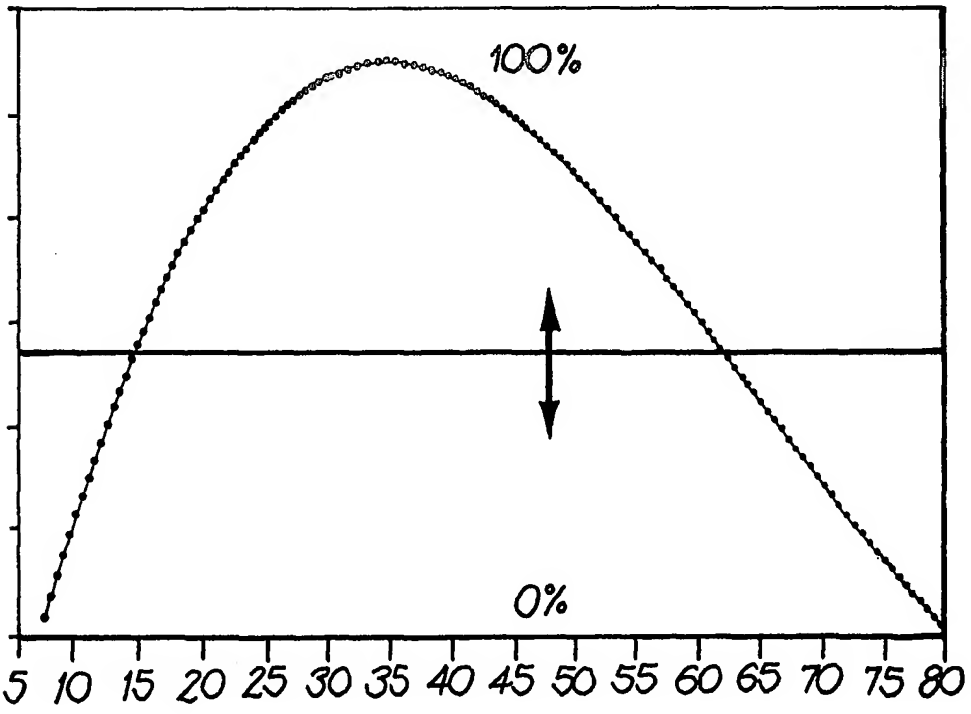
100%
0%
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

FIG. 5

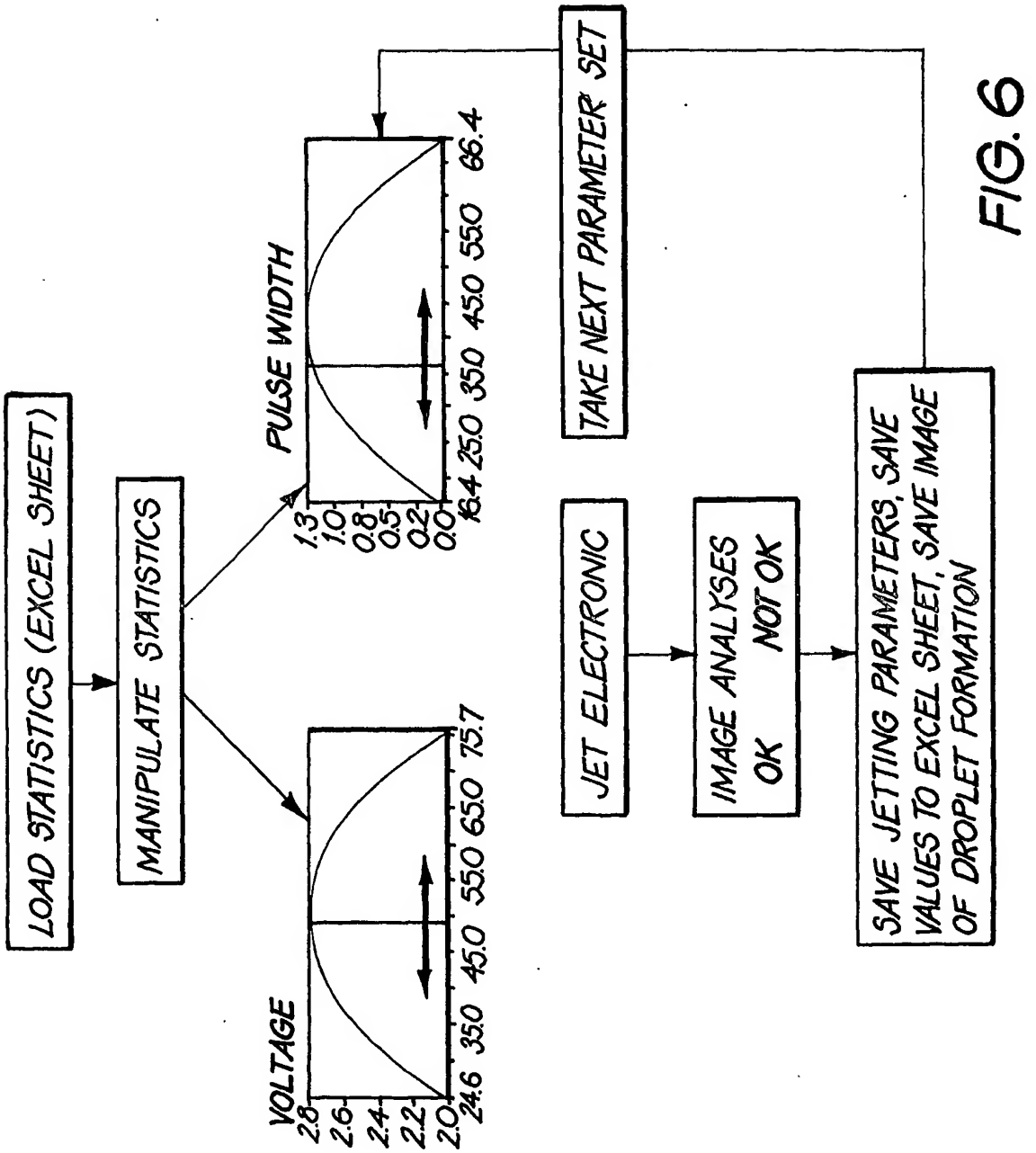
LOAD STATISTICS (EXCEL SHEET)
MANIPULATE STATISTICS
PULSE WIDTH
1.3 1.0 0.8 0.5 0.2 0.0
16.4 25.0 35.0 45.0 55.0 66.4
VOLTAGE
2.8 2.6 2.4 2.2 2.0
24.6 35.0 45.0 55.0 65.0 75.7
TAKE NEXT PARAMETER SET
JET ELECTRONIC
IMAGE ANALYSES
OK NOT OK
SAVE JETTING PARAMETERS, SAVE VALUES TO EXCEL SHEET, SAVE IMAGE OF DROPLET FORMATION

FIG. 6

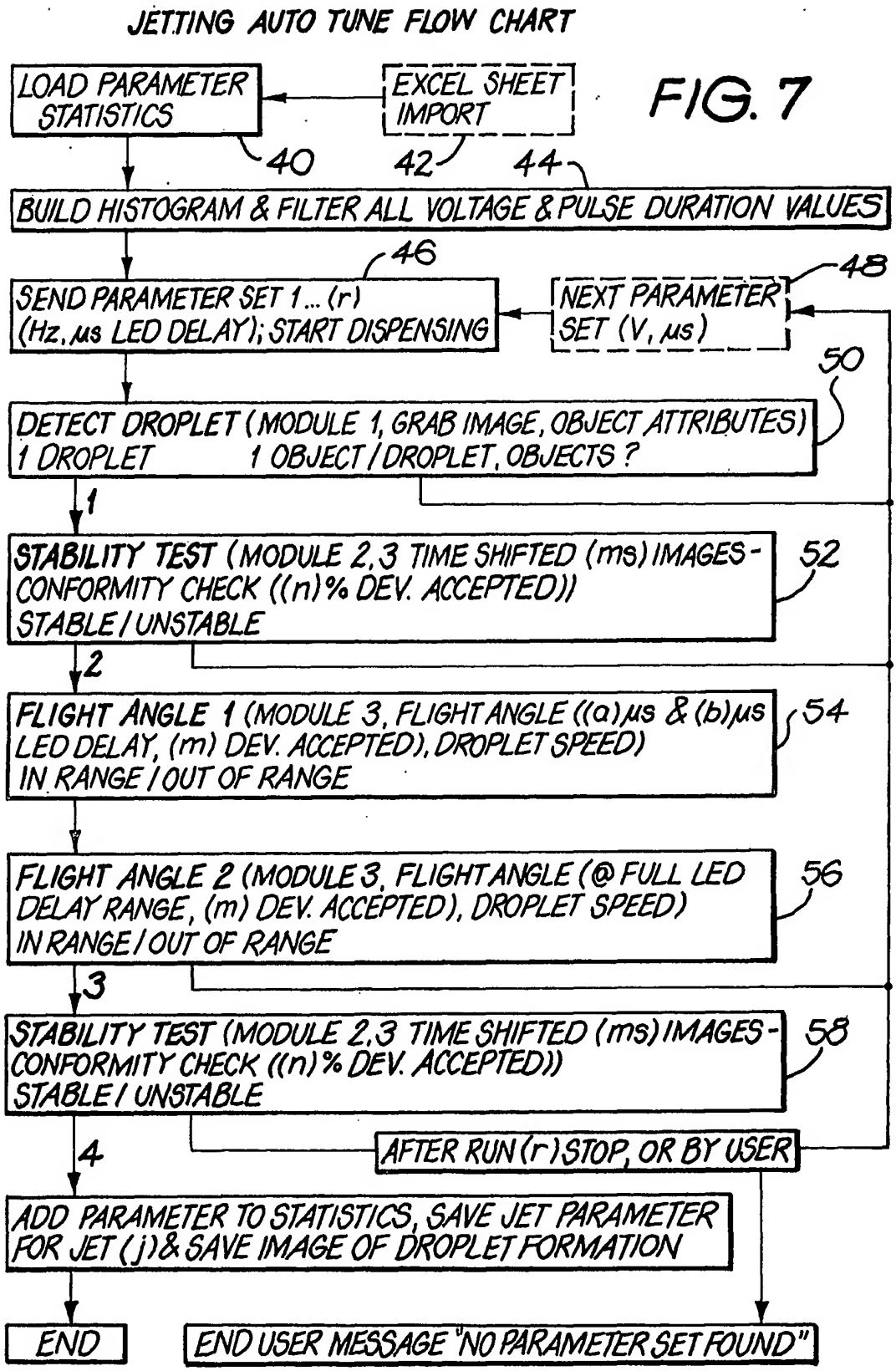
JETTING AUTO TUNE FLOW CHART
LOAD PARAMETER STATISTICS
EXCEL SHEET IMPORT
40
42
44
BUILD HISTOGRAM & FILTER ALL VOLTAGE & PULSE DURATION VALUES
46
SEND PARAMETER SET 1... (r) (Hz, µs LED DELAY); START DISPENSING
NEXT PARAMETER SET (V, µs)
48
50
DETECT DROPLET (MODULE 1, GRAB IMAGE, OBJECT ATTRIBUTES) 1 DROPLET 1 OBJECT / DROPLET, OBJECTS ?
1
STABILITY TEST (MODULE 2,3 TIME SHIFTED (ms) IMAGES - CONFORMITY CHECK ((n)% DEV. ACCEPTED)) STABLE / UNSTABLE
52
2
FLIGHT ANGLE 1 (MODULE 3, FLIGHT ANGLE ((a) µs & (b) µs LED DELAY, (m) DEV. ACCEPTED), DROPLET SPEED) IN RANGE / OUT OF RANGE
54
FLIGHT ANGLE 2 (MODULE 3, FLIGHT ANGLE (@ FULL LED DELAY RANGE, (m) DEV. ACCEPTED), DROPLET SPEED) IN RANGE / OUT OF RANGE
56
3
STABILITY TEST (MODULE 2,3 TIME SHIFTED (ms) IMAGES - CONFORMITY CHECK ((n)% DEV. ACCEPTED)) STABLE / UNSTABLE
58
AFTER RUN (r) STOP, OR BY USER
4
ADD PARAMETER TO STATISTICS, SAVE JET PARAMETER FOR JET (j) & SAVE IMAGE OF DROPLET FORMATION
END
END USER MESSAGE "NO PARAMETER SET FOUND"

FIG. 7

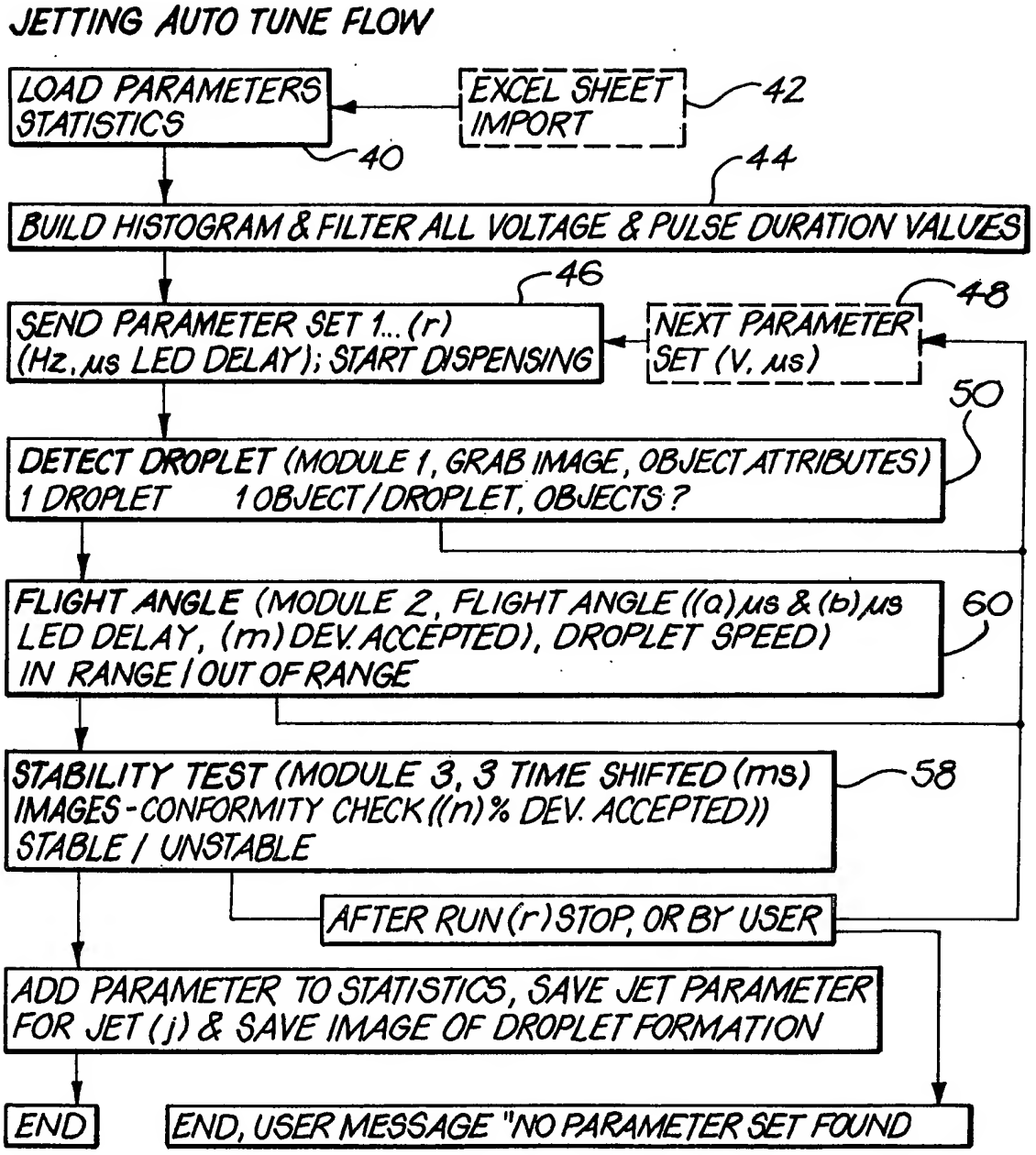
JETTING AUTO TUNE FLOW
LOAD PARAMETERS STATISTICS
40
EXCEL SHEET IMPORT
42
44
BUILD HISTOGRAM & FILTER ALL VOLTAGE & PULSE DURATION VALUES
46
SEND PARAMETER SET 1...(r) (Hz, µs LED DELAY); START DISPENSING
NEXT PARAMETER SET (V, µs)
48
50
DETECT DROPLET (MODULE 1, GRAB IMAGE, OBJECT ATTRIBUTES) 1 DROPLET 1 OBJECT/DROPLET, OBJECTS?
FLIGHT ANGLE (MODULE 2, FLIGHT ANGLE ((a) µs & (b) µs LED DELAY, (m) DEV. ACCEPTED), DROPLET SPEED) IN RANGE / OUT OF RANGE
60
STABILITY TEST (MODULE 3, 3 TIME SHIFTED (ms) IMAGES - CONFORMITY CHECK ((n) % DEV. ACCEPTED)) STABLE / UNSTABLE
58
AFTER RUN (r) STOP, OR BY USER
ADD PARAMETER TO STATISTICS, SAVE JET PARAMETER FOR JET (j) & SAVE IMAGE OF DROPLET FORMATION
END
END, USER MESSAGE "NO PARAMETER SET FOUND

FIG. 8